**REMARKS/ARGUMENT**

Claim 126 has been formally amended to provide antecedent basis for the pressure fluid.

Claim 129 depended on claim 128, which recites "one of the said components," thus providing an antecedent basis for "said one component." The claim has been formally amended to refer to said guiding device. Claim 134 has been formally amended to refer to "displacement parameters," rather than "the displacement parameters. Claim 139 has been amended to depend on claim 138, which recites the distribution bus bar. Accordingly, it is respectfully submitted that the claims are in full compliance with 35 U.S.C. 112.

The rejection of claim 126 under 35 U.S.C. 102(b) as being anticipated by EP 0240965, cited, is respectfully traversed. The reference discloses an electro-hydraulic servo valve assembly (34) which is used for controlling the operation of hydraulic actuators (24), such as rotary actuators, linear actuators and hydraulic motors, and includes a servo valve (26) and a valve controller (32). Each servo valve (26) has associated therewith the valve controller (32) which is combined with servo valve (26) in a unitary package (see column

6, lines 1 to 11). The servo valve (26) consists of a hydraulic manifold (42) having a valve spool (44) and orifices at the lower face thereof for connection to pump (28), return (30) and actuator (24). The valve spool (44) is slidable within manifold (42) for controlling flow of fluid and is controlled by a torque motor (49) (see column 6, lines 33 to 47). The controller (56, 58, 60) is connected to the torque motor (49) and is mounted on the manifold (42) by cover (40). The servo valve (26) of the electro-hydraulic servo valve assembly (34) is connected to the actuator by pressure fluid conductor lines, as shown in detail in Figures 1 and 4. Furthermore, there is disclosed a LED-Display (72) and address switches (74), as described in col. 7, lines 8 to 13. These switches (74) preferably comprise a conventional multiple-pole-dipswitch assembly for setting a unique address at which master controller (26) may communicate this valve controller (34), see col. 8, lines 3 to 8.

This arrangement has the disadvantage that the electro hydraulic (34) is arranged **separately** from the actuator (24) and "long" pressure fluid conductor lines are provided between the servo valve (26) and the actuator (24), and "long" electrical control lines are provided between the valve controller (32) and the position transducer (80). For that reason, the actuator (24) is not suitable for adjustment

procedures in the range of a few milli-seconds and is not able to position the adjustable piston rod to a high degree of accuracy.

The reason why this is so is explained below with reference to a positioning sequence of the piston rod of the actuator.

If the piston rod has to be displaced to a specific extension length or position, system pressure is applied to one of the two pressure chambers of the actuator, which are separated from one another by the piston, and the piston is displaced until it reaches a desired position X calculated by the valve controller of the electro-hydraulic servo valve assembly. Once this position is reached, a signal is transmitted via the electrical control lines to the valve controller of the electro-hydraulic servo valve assembly. One this position is reached, a signal is transmitted via the electrical control lines to the valve controller of the electro-hydraulic servo valve assembly and a position signal is calculated, after which the position signal is applied after a time lag to a torque motor of the servo valve and the valve piston in the servo valve is displaced, preventing hydraulic fluid from being delivered via the servo valve to the actuator.

However, because the valve controller is **arranged separately and at a distance** (e.g. 5 meters) from the actuator, a specific amount of time is needed for the signal to run between the actuator and the valve controller and this position signal is applied to the torque motor of the servo valve with a time lag equivalent to this running time, As a result of this **"long" reaction time** to the instant at which the torque motor of the servo valve is actuated, the desired position X must be preset so that the piston is decelerated early in order to obtain a desired position of the piston rod or extension length. There is an additional problem due to the fact that the pipe friction losses which occur in the "long" pressure fluid conductor lines between the servo valve and the actuator are not taken into account. This necessarily means that the piston rod cannot be positioned exactly because of the associated drop in pressure in the pressure fluid conductor lines. The fact that the piston rod is not positioned sufficiently accurately can cause damage to the actuator or the assembly part being processed, or the function operated by the actuator is not performed satisfactorily.

In contrast to the reference, applicant's control unit, which has a pressure fluid control valve and a control module, is mounted **directly** on the outer surface of the pressure fluid drive, and the control unit has an output **and** input device.

The cited EP `965-A does not disclose that the servo valve and valve controller are mounted directly on the outer surface of a manifold of the actuator (24. The teaching which a skilled person would glean from EP `965-A is that a servo valve assembly consisting of the servo valve and the valve controller is arranged **separately** from the actuator. The servo valve is connected to the pressure chambers of the actuator by "long" pressure fluid conductor lines and to a position transducer of the actuator by "long" electric control lines. Consequently, it would not be an obvious step for the skilled person to mount the control device directly on the drive mechanism and provide an input device on the displacement unit. For the first time, therefore, the displacement unit can now be actuated and programmed from the central control unit and directly on the spot.

The input and output device operates as follows:

Displacement units of the type disclosed and claimed by applicant are generally used to operate a whole range of functions in assembly plants, for example to deliver and discharge an assembly part or to push a bolt into a bore in the workpiece. These assembly plants are laid out in such a way that a unit or a product is assembled from individual assembly parts and a plurality of work stations is provided for this purpose, at which different functions are preformed and which

can incorporate one or more of the displacement units proposed by the invention. One of these work stations might be a joining station, as schematically illustrated in Fig. 1, for example. Since these assembly plants must be designed to process a plurality of different assembly parts, it is necessary to be able to adapt the motion sequence of a displacement unit individually for each and every assembly part to be processed.

In the embodiment specifically described as an example, the individual assembly parts might be bolts of different lengths. These bolts are inserted in bores specifically provided in the workpieces for this purpose. As may be seen from the example illustrated in the highly simplified diagram, it is now necessary for the displaceable component, in particular the piston rod, to be displaced by a first extension length for a first type of assembly part and by a second extension length for a second type of assembly part. The extension length for the first type of assembly part is 200 mm and for the second type of assembly part 80 mm, for example.

The claimed displacement unit makes it possible, during the initialization mode, in readiness for when the individual work stations are activated, preferably one after the other, for the operator to enter specific parameters for the

displacement unit manually on the spot by the input device, such as the displacement of the piston or the extension length of the piston rod, in this particular example.

During the initialization mode and provided the operating system of the joining station is correctly switched off, a corresponding signal can be output via the claimed display element. The parameters entered by the operator, e.g. the extension lengths for the first and second types of assembly parts, can be stored in such a way that they can be edited. If the operating system of the joining station is switched off and the parameters have been stored as applicable, the operator can then also activate the set functions in the other work stations. The parameters duly set for the individual work stations, e.g. the extension lengths, are detected by means of the claimed signaling and monitoring element mounted on the displacement unit and transmitted to the control module of the control system and preferably stored in a memory so that they can be retrieved again.

It is also possible for the parameters needed for the individual motion sequences of the displacement unit, in this particular instance the extension length of the piston rod for the first and second types of assembly part, to be transmitted from the central control unit to the control module of the

control system and displayed to the operator on the display device. If necessary, these transmitted parameters may then be edited by the operator via the input device.

The advantage of providing the input and output device on the displacmeent unit, as claimed, is that it not only allows an operator who happens to be at this work station anyway to make manual interventions at the relevant work station, particularly in the event of a fault, it also enables the fault to be dealt with and the displacement unit activated and displaced again once the requisite entries have been made via the input device, so that the assembly plant can be switched to automatic mode after only a short period. It is also of advantage that the displacement unit can be controlled and programmed both from the external control unit and directly on the spot at the displacement unit. Programming the displacement unit directly on the spot will be useful in situations where complex motion sequences have to be controlled.

The fact that the at least one pressure fluid control valve and the control module are mounted directly on the outer surface of the drive mechanism, as claimed, has the advantage that it dispenses with the need for:

- "long" pressure fluid conductor lines between the drive

mechanism and the pressure fluid control valve, and

- "long" electrical control lines between the signaling and monitoring element and control module.

Based on this feature, the transmission lines for the mechanical (for example air) and electrical signals can be shortened and the short transmission lines enable a rapid response to a change in the switching state of the drive mechanism, resulting in a high positioning accuracy of the component, in particular the piston. This is the case primarily because the pipe friction losses in the "short" delivery lines between the pressure fluid control valve mounted on the drive mechanism and a delivery passage in the drive mechanism are negligible, preventing a drop in pressure in the pressure chamber of the drive mechanism. The displacement unit proposed by the invention, therefore, enables the shortest possible switching times to be achieved, thus increasing the productivity of the assembly plant.

Also of advantage is the fact that the amount of pipework needed is reduced, which in turn brings a significant improvement in the accessibility to individual machine components in the region of a work station of the assembly plant.

The claimed displacement unit proposed is of a **self-contained** design and is already provided with the pressure fluid control valve and control module needed for operation and, in the event of a fault, the **entire displacement unit** can be removed and replaced by an identical new displacement unit designed to perform the same function without the usual lengthy and cost-intensive down-times of the assembly plant. This is due to the fact that, being self-contained, the displacement unit can be replaced and then inspected away from and irrespective of the continuing operation of the assembly plant.

In the prior art, each of the mechanical components of the displacement unit and the servo valve and the valve controller arranged separately from the actuator have to be checked by the operator directly **on the assembly plant**, for which reason it is necessary to shut the assembly plant down. The fact that every mechanical component, the servo valve and the valve controller have to be individually checked also increases the amount of work involved in checking the system.

Another advantage of the claimed displacement unit resides in the fact that the effort involved in assembly and activation can also be reduced because only two main conductor lines have to be connected to the at least one pressure fluid control valve mounted on the drive mechanism and there is no need to

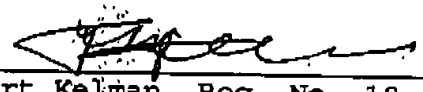
provide conductor lines between the pressure fluid control valve and drive mechanism.

In view of the above, amended claim 126 is respectfully submitted clearly to be patentable. The dependent claims recite various preferred features, and these claims are believed to be allowable with claim 126 on which they dependent directly or indirectly.

A sincere effort having been made to overcome all grounds of rejection, favorable reconsideration and allowance of claims 88-91, 93, 111, 113, 116, 117, and 121-146 are respectfully solicited.

Respectfully submitted,

WALTER STICHT



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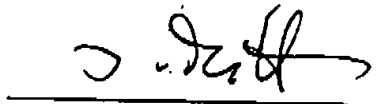

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